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APPLICATION OF GRID PLANNING METHOD IN DRILLING-BLASTING OPERATIONS

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ABSTRACT
The problem occurs almost every day in operation and causes troubles to mining engineers.
The right performance of drilling-blasting work is important for the successful operation of the entire excavation.
The aim of the paper is to point out the importance of planning and how it can contribute to the right organization and make drilling-blasting and other mining activities in mine operations easier. Defining the activities and practical example that has been given are carried out by the use of grid planning and adequate method.

1. Introduction

Grid planning includes steps that makes it possible to define the technological dependencies, the time necessary to carry out all activities in a project, optimal use of machinery, resources and manpower. These are necessary if we want to secure optimal and economic conditions in the implementation of a project.
The methods consist of schematic presentation of a project on a grid diagram that gives the right picture of the order and relationship between all parts and the possibility of logic analysis of the grids in order to obtain the best manner of implementation and follow all activities. The methods also make possible the comparison between the manner of operation and the use of various machinery.

2.0 Activities

The final goal of grid planning is to determine the duration of the entire project.
For the right application of the method of critical path of grid planning, the problem of every day experience has been chosen. This includes planning of drilling-blasting activities during excavation of mineral resources.
Grid planning technique often uses grid diagram to present a project. It is a picture of both duration and dependence of project activities.
The application of grid diagram provides accurate information on the situation every moment, on the effects of various ways of operation and identifies the operations that require rehabilitation.
Because of the simplicity, the method is good for any approach in planning. It fits well into any problem without reducing the advantages. In addition, the method of grid planning can be used in other branches. In mining, the method can be used in pit opening, expecialy in underground mining, bench development, waste dump, drilling-blasting planning, excavation technology etc.

3. Activities of drilling-mining operation

It is necessary to carry out a project analysis - an organization of drilling-blasting operation with the PERT method.
The following time period (in hours) have been estimated:

- drilling -

A_1 - cleaning the area (the bench) in an expected time of 3 hours,
A_2 - cleaning the area (the bench) in 2 hours depending on A_1,
B_1 - block leveling in 3 hours, depending on A_1,
B2 - block leveling in 2 hours, depending on A_2, and B_1,
B_3 - block leveling in 1 hour, depending on B2,
C_1 - overseeing and block formation for drilling in 1 hours depending on B_2,
C_2 - overseeing and block formation for drilling in 2 hours depending on B3 and C_1,
D - making a plan for drilling in 2 hours depending on C_2,
E - marking the terrain for drilling in 3 hours depending on D,
F - installation of power supply in 3 hours depending on B_2,
G_1 - preparation of drilling bit in 2 hours depending on F,
G_2 - preparation of drilling bit in 1 hours depending on E and G_1,
H_1 - drilling of bore holes in 10 hours, depending on G_1 and G_2,
H_2 - drilling of bore holes in 12 hours, depending on H_1 ,
I - control of drill holes in 1 hours depending on H_1,

- blasting -

J - design of blast series in 2 hours depending on H_2,
K - cleaning of blast holes in 2 hours depending on I and J,
L - placing of blast cartridges in blast holes in 2 hours depending on J and K,
M - filling of blast holes with explosive in 4 hours depending on L,
N - stemming of drill holes in 2 hours depending on L,
O - connecting of blast series in 1 hours depending on M,
P - control of blast series in 1 hours depending on O,
Q - protection of surrounding structures in 3 hours depending on N,
R - blast series activation in 1 hour depending on P and Q,
S - check of blast effects in 1 hour depending on R,

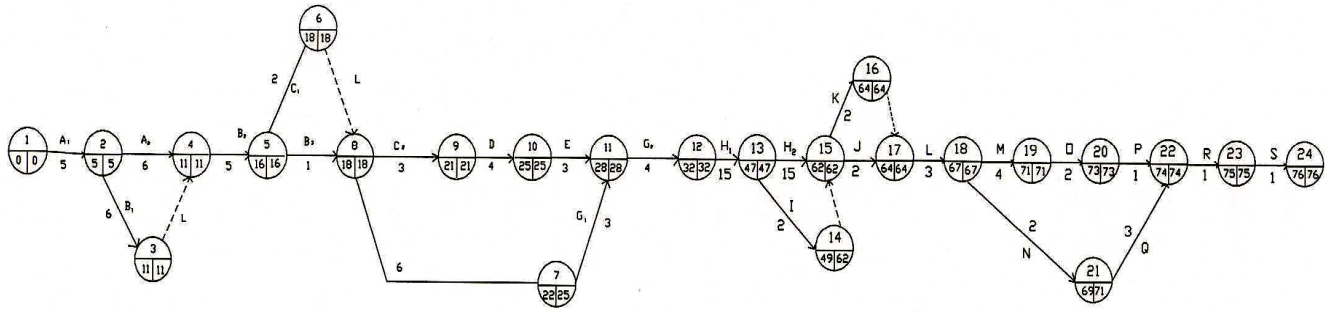
Supplement 1 shows that event no.7 has the earliest time Te-22 and latest Ti=25 hours which means that there is a thirteen hour interval in which the event may occur.

Event 21 has the earliest time of Te=69 and latest of T_I =71 hours which means an interval of 2 hours in which the event may occur without causing delay in project implementation. This time interval is called radiance of the given event. It is calculated with the formula SI=TI -Te.

If we take that the latest time of the final event of the grid diagram is equal to its earliest time TI=te, the critical path is defined as path that passes through the events with 0 radiance. If the events are late, it will cause delay in the whole project. These are called **critical events**. Other events are not critical since they can occur in a shorter or longer time interval.

These times are typical of a mine expressed drilling - blasting operations that are important for the further course of other mining activities such as loading, transportation, ventilation, etc.
The values of the times can be different depending on many factors.The most important factors that influence these values are of course the organization of work, the volume of works, i.e intersection of mine horizon or bench height, the capacity of the mine, the technique performing in the drilling - blasting operations (initiation, type of explosives, etc.). the level of mechanization in the mine, e.t.c.

GRID PLANNING of ACTIVITIES



Critital path: $A_1 - B_1 - A_2 - B_2 - C_1 - B_3 - C_2 - D - E - G_2 - H_1 - H_2 - K - J - L - M - O - P - R - S$

3. Conclusion

The approach in understanding individual problems is an integral one and their solving requires the use of a number of scientific achievements with practical value. The issues regarding planning, management and optimal use of available forces and means in implementing certain activities, deserve special attention since the sources of rational work are sought in them. The methods of grid planning are a simple planning technique in all investment and mining facilities. It is a one new technique for mining to organize and planning all operations speciality this operations in following the implementation in advancement of activities in construction of facilities.

4. References

1. B.A. Kennedy, (1990), 2nd Edition, Surface Mining, Ch 8, SMME, USA
2. Technical reports from mines (2009 - 2010)